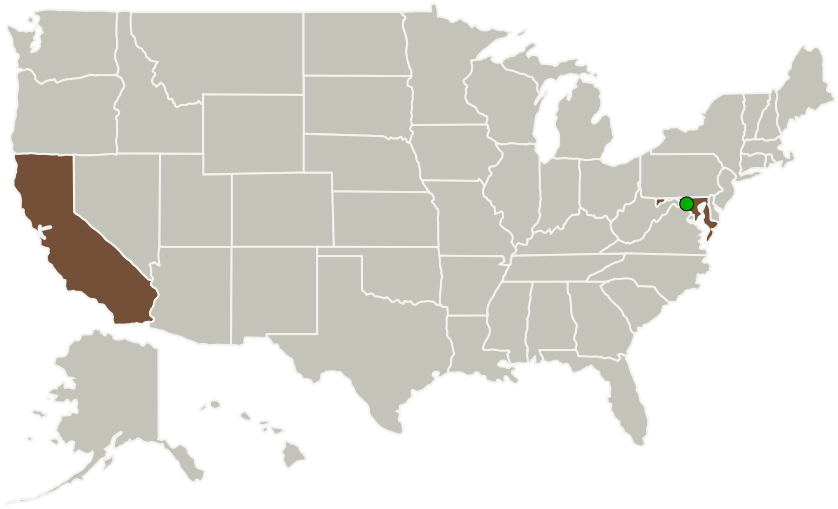
Development of a Single-Frequency Narrow Linewidth 1.5mm Semiconductor Laser Suitable for Spaceflight Operation, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Many space applications rely on the utilization of Light Detection and Raging (LIDAR) techniques. A key component of any LIDAR system is the laser source. Single frequency lasers in the 1.5-2.0mm region of the spectrum, with less than 10kHz linewidth, are needed and space qualification of the laser source is the critical requirement for the intended NASA LIDAR applications. A novel, single-frequency, low noise planar semiconductor external cavity laser has been developed by Redfern Integrated Optics Inc. (RIO). Cavity is based by the hybrid integration of an InP gain chip and a planar lightwave circuit (PLC) with waveguide Bragg grating. The laser performance is characterized by a single-frequency output in the 1550 nm spectral region with a linewidth <3kHz; low phase/frequency noise, low RIN. Additional testing, analysis, and qualification are necessary for its proper applicability and reliable use in space missions. We propose to carry out a study of the suitability of PLANEX for space service, and to determine its potential susceptibility to space and radiation effects. At the end of Phase I, a set of target operational specifications, functional requirements, and associated space qualification protocol will be developed for further Space-Qualified External Cavity Laser (SQECL) based on the PLANEX technology. Work plan included analysis of prior information and definition of target specifications, assessment of space environment effects, like radiation and vacuum, determination of current and target TRL, plan and roadmap for Phase II, development of the approach for the re-design and complete space qualification at Phase 2.

Primary U.S. Work Locations and Key Partners



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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Redfern Integrated Optics, Inc.	Lead Organization	Industry	Santa Clara, California
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
California	Maryland

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140190)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Redfern Integrated Optics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Lew Stolpner

Co-Investigator:

Lew Stolpner

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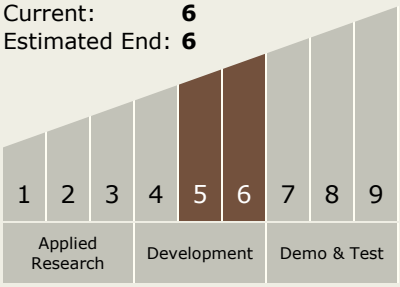
Technology Maturity (TRL)

Start: **5**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System